SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that MELVIN A. JONES, a citizen of the United States of America, resident of Tiffin, County of Seneca, State of Ohio, have invented a new and useful improvement in a

HOT CHAMBER DIE CASTING

which invention is fully set forth in the following specification.

HOT CHAMBER DIE CASTING

TECHNICAL FIELD OF THE INVENTION

This invention relates to an assembly for use with hot chamber die casting. More specifically, the assembly includes a bottom fill gooseneck.

BACKGROUND OF THE INVENTION

Die casting machines generally utilize one of two classifications of casting material pumping systems, either a hot chamber system or a cold chamber system. Hot material chamber die casting machines include parts that are partially submerged in a vat containing the molten metal and thus operate at the temperature of the metal bath. Cold chamber die casting machines are unheated except for the die member which receives the molten metal during the casting process. Hot chamber systems are used primarily for the casting of metals having low melting points such as tin, zinc and lead alloys. Cold chamber machines can be used for die casting most metals, however, they are most commonly used for aluminum, magnesium and copper alloys.

The industry has lavished great care in choosing materials for the construction of hot chamber die casting machines. Improved materials for the various parts have led to enhanced resistance against wear, hardening and softening. The industry, however, has had little success in overcoming failure problems resulting from the high operating pressures present in the hot melt die casting process.

A recent, major improvement in the industry has been a reinforced casting. Specifically, the improvement is a reinforced gooseneck and reinforced components for use with a hot chamber die casting machine. The improvement provides for the reinforcement of the gooseneck, nozzle, and nozzle seat. The preferred embodiment focuses on reinforcing the gooseneck as this is the location where most pressure-caused failures

occur. See U.S. Patent No. 6,481,489 issued to Melvin A. Jones which is herein incorporated by reference.

Another problem has been communication between the pressure cylinder of the gooseneck and the molten metal reservoir. Various attempts have been made to fast fill the chamber of the gooseneck or to more completely reach the bottom of the reservoir of molten material. U.S. Patent No. 4,261,414 discloses a complicated mechanism for rapidly providing molten metal to a die casting machines. This patent discloses a double toggle arrangement including a bell crank pivotally mounted on a yoke. The patent also discloses a double shaft arrangement for filling the chamber of the gooseneck. Shaft 104 operates gate valve 100. Gate valve 100 has two apertures. Aperture 112 provides communication between pump chamber 96 and pot 32. Aperture 114 provides communication between chamber 96 and nozzle 54. Shaft 108 operates pump 110 mounted in chamber 96. Movement of shafts 104 and 108 operate in sync to fill and drain chamber 96 through apertures 112 and 114. Obviously, keeping the shafts in sync would be difficult. While this system may function, it cannot be retrofitted to an existing gooseneck assembly. Maintenance also would be difficult.

BRIEF SUMMARY OF THE INVENTION

I have invented a fast fill assembly that can be retrofitted to an existing gooseneck assembly. In a conventional gooseneck assembly, the intake port typically fills the chamber from the side. See intake post 30 in Fig. 1 of my U.S. Patent No. 6,481,489. I have moved the intake port to the bottom wall of the gooseneck. I also have fitted the bottom intake port with an interior plug. When the plunger moves upwardly, it creates a vacuum the pulls the interior plug upwardly. The vacuum created by the upwardly moving plunger also pulls or sucks molten metal from the lower portion of the reservoir through the bottom intake port into the chamber. The head of pressure created by the

weight of molten metal also forces the molten metal through the open bottom intake port into the chamber. When the plunger moves downwardly, the interior plug moves downwardly and seals the bottom intake port. The interior plug includes a shaft that extends downwardly through the bottom intake port. Preferably, the shaft of the plug includes an exterior plug that prevents the interior plug from loosing communication with the bottom intake port.

The gooseneck and pressure cylinder are partially submerged in the reservoir of molten non-ferrous metal. The intake port provides a passageway between the pressure cylinder and the reservoir. With the plunger in the up position, molten metal is free to flow from the reservoir through the intake port and into the pressure cylinder. When the plunger is moved downward, it seals off the pressure cylinder from the reservoir. As the plunger continues to travel downward, it pressurizes the molten metal and forces the molten metal contained in the cylinder through the channel in the gooseneck, through the nozzle seat and the nozzle into the die cavity of the die thereby filling the cavity and forming the cast part.

Other objects and advantages of the present invention will become apparent to those skilled in the art upon a review of the following detailed description of the preferred embodiments and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional side elevational view of a die casting machine and die according to the present invention with the plug in the down position.

Fig. 2 is a cross-sectional view of Fig. 1 with the plug assembly in the up position.

Fig. 3 is a partially exploded view showing a recess for the plug assembly.

Fig. 4 shows the exterior plug of the plug assembly in greater detail.

Fig. 5 is a cross-sectional view of Fig. 1 showing the plug assembly without the exterior plug.

Fig. 6 is a partially exploded view showing a plug assembly which is a ball bearing.

Fig. 7 is a partially exploded view showing a sleeve with the plug assembly in the sleeve.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

This assembly for use with hot chamber die casting comprises a gooseneck assembly having a channel extending therethrough, wherein the gooseneck assembly is made from a ferrous material. The gooseneck assembly has an exterior surface, an interior surface and an interior located between the exterior and interior surfaces. The interior surface defines the channel extending therethrough. U.S. Patent No. 6,481,489 discloses an embodiment where reinforcing members are located in the interior of the gooseneck assembly.

Fig. 1 shows a hot chamber die casting machine having a submerged plunger mechanism, a gooseneck and a nozzle. Machine 12 consists of molten metal reservoir 18, plunger 20, pressure cylinder 22, gooseneck 24, nozzle seat 26 and nozzle 10. Nozzle 10 is designed to matingly engage with die cavity 28 of die 16 so that molten metal 14 is received into die cavity 28 from the machine operation.

Gooseneck 24 and pressure cylinder 22 are partially submerged in reservoir 18 of molten non-ferrous metal 14. Bottom intake port 30 provides a passageway between pressure cylinder 22 and reservoir 18. With plunger 20 in the up position (as shown in Fig. 2), molten metal 14 is pulled or forced from reservoir 18 through intake port 30 and into pressure cylinder 22. When plunger 20 is moved downward (as shown in Fig. 1), plug assembly 40 seals off pressure cylinder 22 from reservoir 18 as shown in Fig. 2. As plunger 20 continues to travel downward, it pressurizes molten metal 14 and forces molten metal 14 container in cylinder 22 through channel 32 in

gooseneck 24, through nozzle seat 26 and nozzle 10, into die cavity 28 of die 16, thereby filling the cavity and forming the cast part.

After the metal has solidified in die cavity 28, plunger 20 is retracted, thereby uncovering intake port 30 and molten metal again is pulled and forced from reservoir 18 into pressure cylinder 22, thus readying machine 12 for the next cycle.

Fig. 1 shows plug assembly 40 in the downward position. Plug 42 matingly engages interior surface 46 of cylinder 22 and seals off cylinder 22 from reservoir 18.

Fig. 2 shows plug assembly 40 in the up position. Bottom intake port houses (30) plug assembly 40. When plunger 20 is in the up position, plug assembly 40 is in the up position. This provides a passageway between pressure cylinder 22 and reservoir 18. Thus, molten metal 14 is pulled from reservoir 18 through bottom intake port 30 into cylinder 22. When plunger 20 is down, plug assembly 40 is down. This seals off cylinder 22 from reservoir 18.

Plug assembly 40 includes interior plug 42 and shaft 44. Bottom intake port 30 houses shaft 44. Preferably shaft 44 is longer than port 30 and smaller than port 30. Typically port 30 and shaft 44 have a circular cross-section and shaft 44 has a smaller diameter in order to allow molten metal to flow when the assembly 40 is in the up position. The longer length of shaft 44 prevents assembly 40 from being pulled completely out of port 30 into cylinder 22.

Fig. 3 is a partially exploded view showing recess 50 in interior surface 46. Recess 50 houses plug 42 and circumscribes opening 54 of passageway 56 of port 30. Recess 50 preferably enhances the ability of plug 42 to mating engage interior surface 46 and and seal off cylinder 22 from reservoir 18.

Fig. 3 and Fig. 4 shows an embodiment wherein plug assembly 50 including exterior plug 60. Exterior plug 60 engages exterior surface 62 of gooseneck 24 when assembly 40 is in the up position and molten metal is

filing cylinder 22. Exterior plug 60 includes at least one aperture 66 therein. Aperture 66 allows molten metal 14 to flow into cylinder 22 through passageway 56. Preferably aperture 66 is a plurality of apertures.

Fig. 5 shows plug assembly 40 with interior plug 42 and shaft 44, but without exterior plug 60. Shaft 44 is longer than port 30. The longer length of shaft 44 prevents assembly 40 from being pulled completely out of port 30 into cylinder 22.

Fig. 6 shows an embodiment wherein assembly 40 is a ball bearing. Preferably recess 50 is used when assembly 40 is a ball bearing. In this embodiment, bottom surface 70 of plunger 20 includes recess 72. Recess 72 matingly engages ball bearing 40 when plunger 20 is in the down position.

Fig. 7 is a partially exploded view showing a sleeve with the plug assembly in the bottom of the sleeve. Fig. 7 shows sleeve 80 extending to the bottom of cylinder 22. Sleeve 80 includes sleeve bottom 82 and sleeve port 84. Port 84 houses plug assembly 86 when assembly 40 is in a downward position. Preferably port 84 includes recess 88. Plug assembly 86 includes strainer 90. Plug assembly 86 moves upwardly and downwardly in much the same fashion as does plug assembly 40. Sleeve 80 may be made of grey iron, steel, alloyed steel and the like.

Strainer 90 is similar to exterior plug 60 of Fig. 4 except strainer 90 has a multiplicity of apertures 66. In one embodiment strainer 90 is made of a mesh material.

The process and apparatus of this invention provides for a simpler and faster operation with more shots per hour. Strainer 90 enables cleaner metal into chamber 22. The cleaner molten metal allows for longer sleeve, plug and plunger life. The bottom fill provides a higher and more constant temperature for the molten metal than the traditional top fill arrangements. Bottom fill also reduces or eliminates dross from entering the cylinder. Dross is oxidized molten metal typically found at the top of a molten metal

reservoir such as reservoir 18. Dross is a contaminant to the gooseneck and cylinder and shortens the life of the apparatus.

The weight of molten metal 14 in reservoir 18 provides head of pressure necessary to push molten metal 14 from reservoir 18 through bottom intake post 30 into pressure cylinder 22 when plunger 20 moves upwardly. The head of pressure works with the vacuum created by upwardly moving plunger 20 to fill cylinder 22. In a conventional gooseneck assembly, the intake post typically fills the cylinder from the side near the top of the reservoir. The pressure head near the top of the reservoir pot has little or no head of pressure. Bottom filling provides a more efficient, economical and faster drawing of molten metal from the reservoir (pot).

The term "gooseneck" is not to be constructed as meaning "in the shape of a goosenek", but merely an arrangement with a similar function and providing a duct channel or bore for the molten metal to be injected from the cylinder, upwards alongside the cylinder and laterally to a die.

The above description of the invention and the alternative embodiments is intended to be illustrative of the invention as a whole and not limiting up [on the scope of the following claims. It is envisioned that the reinforcing members may be incorporated into any cast member who is exposed to internal pressure and subject to bursting and failure as a result of the pressures.

The above detailed description of the present invention is given for explanatory purposes. It will be apparent to those skilled in the art that numerous changes and modifications can be made without departing from the scope of the invention. Accordingly, the whole of the foregoing description is to be construed in an illustrative and not a limitative sense, the scope of the invention being defined solely by the appended claims.